TO: Portland Harbor Manager Group

FROM: Kristine Koch, Carl Stivers, Laura Jones, Dawn Sanders, Linda Scheffler, Andy Koulermos and Karen Tarnow

DATE: December 13, 2006

RE: Framework for Collecting Stormwater Data to Support the Portland Harbor RI/FS

The attached proposal was developed by Kristine Koch, Carl Stivers, Laura Jones, Dawn Sanders, Linda Scheffler, Andy Koulermos and Karen Tarnow. It represents the consensus of the group.

The proposal describes the framework for stormwater sampling and analysis and discusses a few of the higher level implementation issues. There are a myriad of other significant details – some of which the group has discussed and some not – which would be addressed during the development of the initial FSP and QAAP.

The major components of the sampling framework include the following:

1. Flow-weighted composite water samples from three storm events; analyzed for totals only (not dissolved)
2. Sediment trap deployment for a minimum of three months
3. Continuous flow monitoring at each sediment sampling site for the duration of the deployment period.

The likelihood that this work will get done this water year will be greatly increased by limiting the number of contractors and labs doing this work. This will also improve the value of the data by minimizing discrepancies that occur when different parties do the work.

The technical team needs direction from the managers on the following matters:

Question #1: When developing sampling plans for specific sites, should we give consideration to source control issues when deciding whether to deviate from the standard list of analytes? For example, if DEQ determines that dissolved data will be needed for the source control evaluation, would we add this to the list of analytes?

Question #2: Should we analyze the whole water samples for phthalates, or is it sufficient to rely on sediment trap data to evaluate phthalate loads?

> Discussion: If we want to analyze water samples for phthalates, we need to design the entire water sampling protocol around this objective to minimize the risk of sample contamination. This adds cost and complexity to the procedures and doesn't guarantee that you will get valid data because phthalate concentrations in water samples are typically very low and the contamination risk is great.

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PROPOSED FRAMEWORK FOR COLLECTING STORMWATER DATA AT PORTLAND HARBOR UPLAND SITES AND OUTFALLS
12-13-06

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1. Purpose of the Framework

The purpose of this sampling and analytical framework is to provide data for evaluating the potential risk and recontamination threat from stormwater discharges into Portland Harbor. This data will initially be used for understanding the magnitude of stormwater impacts to the harbor (using stormwater modeling for harbor-wide mass loading as inputs to Bruce Hope's fate and transport model), developing the draft in-water RI, and identifying data gaps that need to be addressed.

2. Whole Water Sampling Methodology

Recommended Approach: Analyze flow-weighted composite samples of 3 storm events to calculate Event Mean Concentrations (EMCs) of COIs.

Storm Event Definition: A sampled storm should be predicted to produce >0.2 inches rainfall over a minimum of a 3 hour period and have been preceded by a 24 hour dry period (< 0.1 inches). The objective is to get a sample that represents the entire storm hydrograph. The sampling period can be cut off at 24 hours if the storm lasts longer than that.

Sample Analysis: See the Stormwater Analyte Table for a list of analytes. The list of analytes may be modified based upon site-specific considerations.

Totals vs. Dissolved: For sampling done this water year, we will only require analysis of whole water samples (totals) rather than whole water and filtered samples. This decision was based on a lengthy discussion and a combination of considerations:

- Dissolved data will likely be needed for completion of the RI/FS, but it is not essential to have it at this time.
- The time and resources required for sample analysis and data reduction is significant; we should be looking for all opportunities to reduce the analytical requirements for this sampling exercise so that we can meet the most important data needs in the most timely manner.
- Organics are not typically detected because of the low concentrations in filtered water samples, and metals are not believed to be a driver for DQO #1.

The most convincing arguments for getting dissolved data this year would be (1) to determine that the partitioning coefficients used in the stormwater model are representative of what occurs in stormwater, and (2) to measure the dissolved/colloidal concentrations for feeding into the risk analysis. If it is determined that these data are necessary this year, it could be accomplished by collecting and analyzing grab samples from selected sites. Whenever a dissolved analysis is done on a water sample, it should include analysis of dissolved organic carbon (DOC).

3. In-line Solids Sampling Methodology

Equipment: DOE-style sediment traps. We acknowledge that these sediment traps may not collect a certain fraction of finer particles and/or larger sediments that could be making it to the river but have agreed that this is OK.

Minimum Time of Deployment: Three months

Placement Considerations:
- Field recon is necessary; identify back-up sampling sites when possible
- Look at DOE and USGS documents for guidance on placement and other considerations to help ensure a successful deployment
- Identify any non-stormwater flows that could enter the conveyance during the sampling period (e.g., groundwater, sheet flow from other sites, batch discharges). Depending on the source, the sample plan may need to include collection of information on the nature, amount and timing of those flows.

Checking the Equipment:
- Minimum of monthly inspections
- If bottle is half full, collect and archive the sample (freezer storage) and replace with an empty bottle
- If little sediment is present at the first monthly check, consider whether repositioning or relocating the equipment would be a better option

Sites Where Sediment Trap Placement is Infeasible:
- If it is a land use sampling site, select another representative outfall or basin; alternately, select another location within the basin, as long as the area is still representative of that land use (e.g., relocation may be necessary if there is river backflow).
- If it is a high priority sampling site, it may be necessary to use a different approach. The preliminary recommendation from the technical team would be high volume filtered sampling of three storm events, but this issue requires further consideration.

Sample Analysis:
See Stormwater Analyte Table for a list of analytes. The analytes have been ranked in priority order in the event that the sample size is insufficient to run all analyses. The specific analytes and priority order may be modified based upon site-specific considerations.

It is unlikely that we will get large enough samples to do a grain size analysis at most sites. The drawback is that we will not know the portion of the sediments large enough to be considered settleable (> 300-400 ug). This would be useful information to have for evaluating recontamination potential, which could be further supported by analysis of the contaminant concentrations associated with the larger and smaller particle fractions.

4. Flow Measurement
Flow meters should be used in conjunction with water sampling to facilitate collection of flow-weighted composites.

In addition, continuous flow data should be collected at all sediment trap sites for the duration of the deployment period so it is possible to use the sediment trap data to estimate average annual loading from stormwater.

5. Data Use
By conducting both sediment and whole water sampling for each site/outfall, we will have two different datasets on contaminant concentrations and thus two different ways to determine mass loading.

- The sediment trap data will be used in conjunction with TSS data from the water samples and runoff volume to calculate mass loading associated with particulates.
- The contaminant EMC values from the whole water sample will be multiplied by runoff volume to calculate mass loading.

We expect that this will result in two different predictions of mass loading at some sites. Since neither method is inherently better than the other, both predictions will be considered lines of evidence for evaluating the risk or recontamination threat posed by the site and to identify any data gaps that need to be filled.

TSS is a critically important component of the mass loading calculation, yet it is reasonable to expect that the three TSS data points from the composite water samples may not be representative of the range of EMCs that would occur throughout the year at any given site. When calculating and evaluating mass loads, it is important to look at the TSS data in conjunction with historic TSS data from that site (where available), literature values for land use-based TSS concentrations (e.g., ACWA study) and any other applicable sources of TSS data. It is likely that additional TSS data will be needed at some if not all sampling sites to validate the loading calculations.

6. QA/QC
Details of the sampling program will be documented in a quality assurance project plan (QAPP). The QAPP will describe quality assurance/quality control (QA/QC) procedures that will be used to complete the storm water investigation. The QAPP for the storm water investigation will be developed within the framework of the existing LWG Round 2 QAPP (LWG 2004) and Addenda for the on-going LWG investigations.

For in-line sediment samples, the storm water investigation requires development of specific requirements for field and laboratory QC samples because the mass of material collected is anticipated to be limited. For sediment samples, the QAPP will include the collection of field QC samples and additional mass for laboratory QC samples (matrix spike, matrix spike duplicate or laboratory duplicate) as follows:

- Field replicate, 1 per 20 stations
- Laboratory QC samples, 1 per 20 stations

- Equipment rinsate blank for phthalates, 1 per 20 samples

Field replicates will be generated by deploying sediment traps with additional sample collection vessels, and compositing the sediment from each half of the sediment trap collection vessels, separately, into two subsamples for analysis. Analysis for laboratory QC samples will be conducted by dividing the total sediment collected into 3 aliquots of equal mass for the laboratory analysis of the sample, matrix spike, and matrix spike duplicate.

For water samples, the sampling program will be designed to collect additional volume for field and laboratory QC samples. The QC program for water samples includes:

- Field replicates, 1 per 20 stations
- Laboratory QC samples, 1 per 20 stations
- Equipment rinsate blank for all analyte groups

The inclusion of phthalates in the anlayte list requires careful consideration in the design of the sample collection program to ensure that the sediment and water samples do not come into contact with phthalate-containing material. Because the water samples require pumping and additional handling for compositing, the likelihood of field contamination from contact with phthalate-containing components increases and could result in qualification of the data if phthalates are detected in the associated field blank samples.

Attachment 1: Stormwater Analytes, Methods, Detection Limits, and Sample Size.

Priority	Analyte	Method Protocol	Method Procedure	Units	Min. Sample Size		Additional mass for Lab QC		Addl. MassField for field dup/rep		Estimated Unit Cost per Analysis
Sediment Samples											
1A	PCB Congeners	EPA 1668A	HRGC/HRMS	pg/g	10	g	20	g	10	g	$925
1B	TOC	Plumb 1981	Combustion: coulometric titration	percent	1	g	2	g	1	g	$50
1C	Percent Solids	PSEP 1986	Gravimetric	percent	1	g	2	g	1	g	$10
2	Organochlorine pesticides	EPA 8081A	GC/ECD	µg/kg	10	g	20	g	10	g	$190
3	PAHs and Phthalates	EPA 8270C	GC/MS low-level LVI	µg/kg	20	g	40	g	20	g	$285
4	Metals	EPA 6020/7471A	ICP/MS; CVAA for Hg	mg/kg	15	g	30	g	15	g	$215
5	Herbicides	EPA 8151A	GC/ECD	µg/kg	10	g	20	g	10	g	$195
6	Grain size	PSEP 1986	Sieves and pipette method	percent	100	g	200	g	100	g	$150
				Subtotal	167	g	334	g	167	g	$2,020
Water Samples											
1	TSS	EPA 160.1	Filtration and drying	mg/L	0.5	L	1	L	0.5	L	$12
2	TOC	EPA 414.1	Chemical oxidation	mg/L	0.05	L	0.1	L	0.05	L	$32
3	Total Metals	EPA 6020/7471A	ICP/MS; CVAA for Hg	µg/L	0.3	L	0.6	L	0.3	L	$215
4	PAHs[1]	EPA 8270C	GC/MS SIM	µg/L	1	L	2	L	1	L	$215
5	Phthalates[1]	EPA 525.2	GC/MS	µg/L	1	L	2	L	1	L	$175
6	PCB Congeners[2]	EPA 1668A	HRGC/HRMS	pg/L	1	L	2	L	1	L	$825
7	Herbicides	EPA 8151A	GC/ECD	µg/L	1	L	2	L	1	L	$195
				Subtotal	4.85	L	9.7	L	4.85	L	$1,669

For sediments for priority 1A, 1B, and 1C, the available sample mass will be split to conduct analyses for all 3 analytes if PCB congeners are analyzed.

Metals in sediment: Aluminum, antimony, arsenic, cadmium, chromium, copper, lead, nickel selenium, silver, zinc, mercury (Round 2)

Metals in water: Aluminum, antimony, arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, zinc, mercury (Round 2A)

Note - Site-specific analyses for butyltins, PCDD/Fs, organochlorine pesticides, and TPH may be added for individual sites.

Organochlorine Pesticides: At this point, we agreed that we would only analyze for pesticides in stormwater samples on a site-specific basis, because the Round 2 data suggests that we will see mostly non-detects for 1 or 2 Liter samples. However, we will reconsider this decision if data from the Far Field sampling events suggest there might be a significant issue.

[1] The ACGs for selected organochlorine pesticides, PAHs, and phthalates cannot be met for all analytes by the available analytical methods However, these methods/MRLs provide consistency because they are being us for analysis of the Round 2 and 3 surface water data.

[2] The ACG (from LWG QAAP) is for total PCBs; there are no ACGs for individual congeners. The Tech Team felt that 1 Liter would be a sufficient sample size given where most detection limits are compared to the Total PCB congener results for the Round 2A surface water samples (in the 100 pg/L range). If stormwater sample concentrations are lower than that, they are effectively diluting the river water.

Attachment 2: Collecting Stormwater Data at PH Sites: "Best Case" Scenario Timeline 12/13/06

Start-up Assumptions:

1. RPs agree to pool resources and allow LWG to contract with a "short list" of consultants to conduct the work (e.g., one to work with Tech Team do develop initial FSP; two consultants to do site recon and equipment installation/maintenance; one consultant to construct sediment traps

2. Capable project leader is identified and available to devote their time to project oversight.

4. This schedule assumes 20 sites will be sampled. There would be some savings if the # of sites were reduced, but probably not much more than a week.

NOTE: "Week 1" begins once the project leader and consultants are available to begin work on the project. In addition, keep in mind that this schedule is VERY optimistic and assumes delays won't occur (such as locating and receiving equipment), that site-specific FSPs can actually be developed in one week (this is much, much shorter than the norm), that we have the optimal involvement/alignment of consultants, and that a myriad of other logistical issues don't cause delays.

Week 1 Week 2 Week 3 Week 4 Week 5 Week 6 Week 7 Week 8 Week 9 Week 10 Week 12 Week 13

Project Leader convenes and orients consultants; develops equipment lists and work orders; etc.

Assumes capable person is available for full time commitment and has strong administrative support. Assumes consultants are available to begin work and there are no significant contracting issues

Tech Team works with consultant to develop robust FSP that will serve as the framework for FSPs at all other sites.

Assumes consultant and Tech Team are available to commit time to this effort.

Do recon at all sites to identify sampling locations and equipment design needs.

Assumes a minimum of 1/2 day per site with 1 or 2 teams conducting the work. Assumes RPs are ready, willing and able to provide access to site, engineering staff, blueprints and reports, etc.

Order and purchase equipment

Assumes expedited procurement and bulk orders.

Construct sediment traps

Assumes 1 group doing the work

Consultants draft FSPs

Assumes 1 week do draft FSP using Framework

Project leader or tech team reviews FSPs

Assumes 1 week for review and DEQ PMs or City staff are available for consultation. Assumes Framework is adhered to and no significant site-specific issues arise

Consultants finalize FSPs

Assumes 1 week to finalize

Install sediment traps and flow meters

Assumes 2 consultant teams doing installations with avg of 1 day per site. Assumes equipment is readily available and no functional problems occur

WEEK 7: BEGIN SEDIMENT COLLECTION

Calibrate and set up water sampling equipment

Assumes 2-3 weeks flow data needed for calibration. Assumes no equipment failures.

WEEK 10: BEGIN WATER SAMPLING